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Vegetation of Asuncion: A Volcanic Northern Mariana Island

Marjorie V.C. Falanruw

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The vegetation of Asuncion in the Northern Mariana Islands was mapped by examining aerial photographs and dividing the vegetation into six types. This young volcanic island has been recommended for protection by the International Biological Programme. A generalized vegetation map and listing of species are provided as well as notes on fauna of this island seldom visited by scientists. The vegetation pattern is related to the history of the island.

Retrieval Terms: Asuncion, Volcanic Northern Mariana Islands, Commonwealth of the Northern Mariana Islands, vegetation, Micronesia, *Terminalia rostrata* Fosb. & Falanruw, *Emoia slevini* Brown and Falanruw, Islands for Science

Cover: Asuncion, as seen from the southeast, has steep southeastern and eastern coast landslide scars as well as a shallow crater. On the lower slopes, left, are *Terminalia* and *Pandanus* scrub forests.

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INTRODUCTION

Asuncion is the second highest island in the volcanic Northern Mariana Islands. The island (lat. 19°40' N, long. 145°24' E) is a steep volcanic cone rising to 891 m (2923 ft), with a land area of some 7.3 km² (2.81 mi²). Asuncion is currently uninhabited and has been proposed for protection under the International Biological Programme's "Islands for Science" program.

The volcanic Northern Mariana Islands lie in a chain extending from lat. 16°22' N, long. 145°40' E to lat. 20°32' N, long. 144°54' E. Other islands are Anatahan, Sarigan, Guguan, Alamagan, Pagan, Agrihan, Maug and Farallon de Pajaros (also called Uracas), (*fig. 1*). The islands range from the young, active

and almost barren Farallon de Pajaros in the north to the lushly vegetated, apparently dormant Anatahan in the south. Six of the islands have active volcanoes, and three of these have erupted in the last 75 years, including a spectacular eruption of Mount Pagan in May 1981. All are high islands ranging from Maug, whose three islets rise 178-227 m (584-746 ft) above the sea, to Agrihan which, at 965 m (3166 ft), rises above all other islands in Micronesia.

This bulletin describes the vegetation types of Asuncion, and includes notes on the history of the island and its fauna.

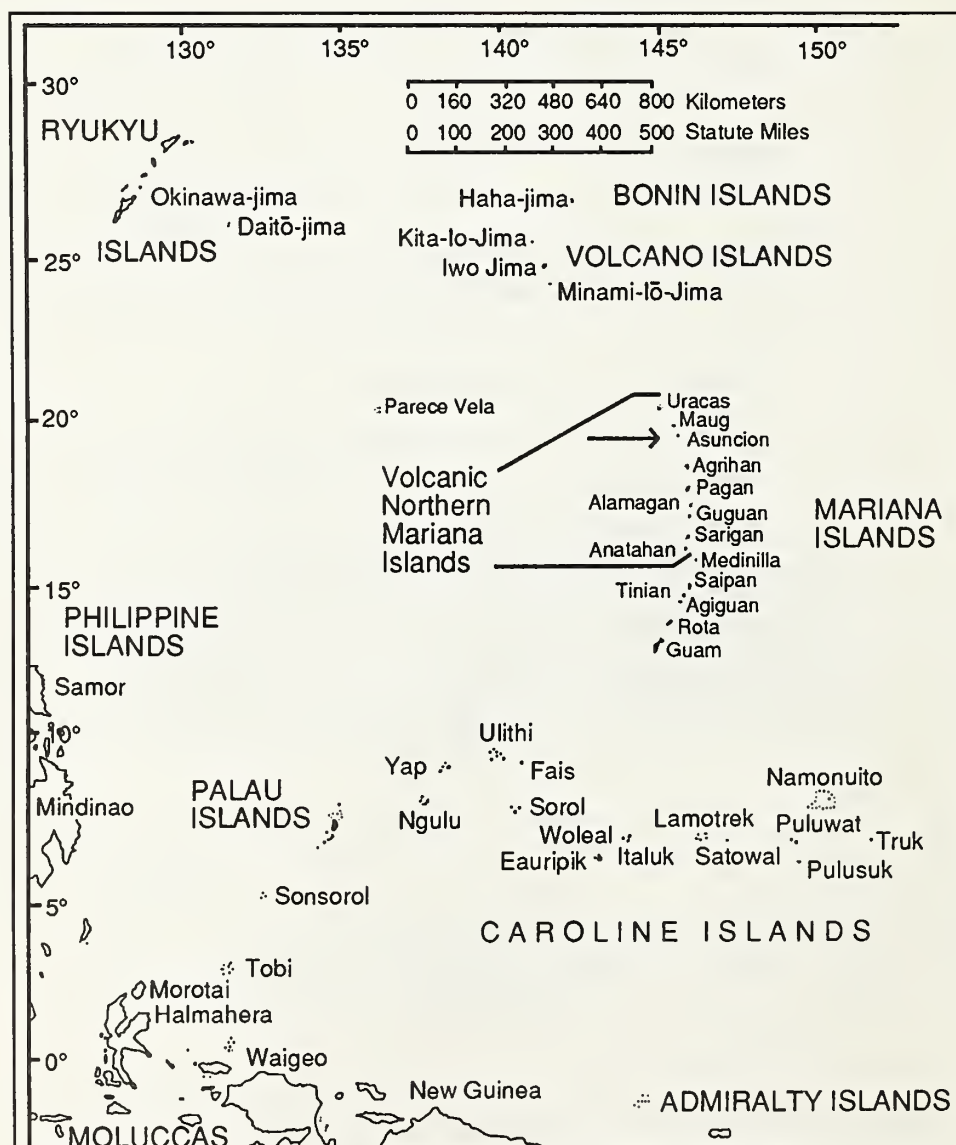


Figure 1—Asuncion lies in the northern part of the volcanic Northern Mariana Island chain.

HISTORY

The first written account of Asuncion appears to be that by the Jesuit Priest Sanvitores, who found Asuncion inhabited when he visited the island in August 1669 (Garcia 1683). In 1695 the inhabitants of Asuncion were brought to Saipan (Lehne and Gabler 1972). Subsequent accounts refer to the northernmost Marianas as "las Islas de las Bolcanes" because of two volcanoes on Pagan and one on Asuncion which were "chasms of fire." La Perouse (1797, Vol. 2, p. 308-309) described Asuncion:

The most vivid imagination could with difficulty depict a more horrible place . . . a perfect cone, the sides down to 40 toises¹ above sea level being as black as coal. A few coconut trees occupying no more than 1/15th of the circumference of the island, on a depth of 40 toises, huddled from the east winds, this is the only place for the ship to tie up.

The shore party reported:

The flowing lava had formed ravines and precipices, bordered by a few stunted coconut trees, very sparse and interspersed with lianas and a small number of plants, among which walking was difficult and slow. The lava which came out from the crater covered the sides of the cone to a line 40 toises from the sea; the top seemed vitrified, so to speak, but of black glass, the color of soot. We never saw the summit which was always topped by clouds; but while we did not see it smoke, the odor of sulfur made me think that it was not quite extinct yet, and that the last eruption was perhaps not

very ancient, as there were no traces of decomposition of the lava of the middle of the mountain.

From this account, there apparently had been volcanic activity between the visits of Sanvitores in 1669 and the visit of La Perouse in 1786. Beechey (1831, p. 438), who visited the island in 1827 some 41 years after La Perouse, reported:

Time must have made an agreeable alteration in the appearance of this island since it was first visited by La Perouse. Instead of a cone covered with lava and volcanic glass, and presenting the forbidding aspect he describes, we traced vegetation nearly to the summit, and observed woods of palm-trees skirting its base; particularly in the southwest side.

Tayama (1936) and Tanakadate (1940) reported an eruption in 1906 described in the Japanese sailing directions of 1931. This activity is believed to have resulted in the two tongues of fresh lava on the upper slope of the west side of the volcano (*figs. 2, 3*). This fresh scar was steaming in 1924. In 1975, I found this area of fresh lava to consist of cinder sand and rocks that were no longer steaming but remained mostly barren of plant life. I detected no scent of sulfur and could see no steam emitting from the summit.

The history of botanical exploration of the volcanic Northern Mariana Islands is presented by Fosberg and others (1975). This bulletin is the first in a series of updates on the vegetation of the islands based on previous accounts, the examination of more than 1500 aerial and ground photographs taken between 1944 and 1975, and five field trips to these islands between 1971 and 1979 that resulted in the collection of more than 900 sets of

¹Forty toises = 78 m (256 ft).

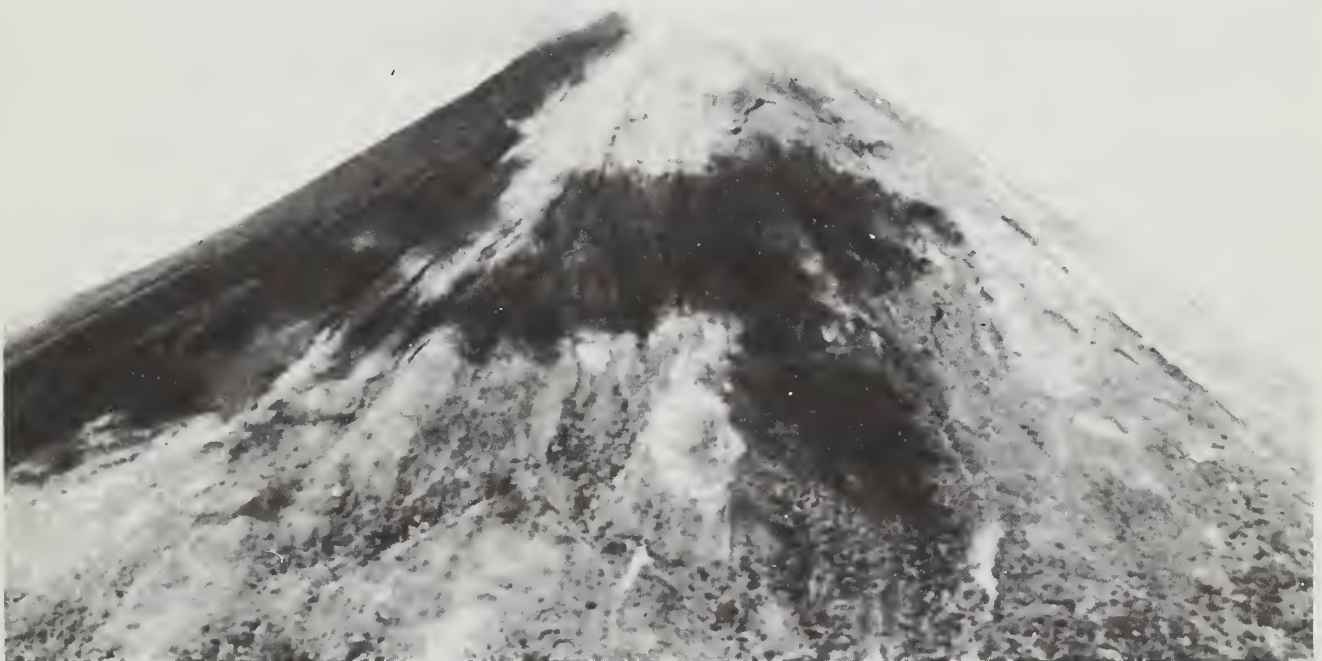


Figure 2—The southwest slope of Asuncion, in 1951, has some vegetation, but the peak is mostly barren areas of slides and ridges.



Figure 3—The southwest slope of Asuncion, photographed in 1975. The inverted V-shaped lava flow of 1906 can be seen on the upper left slope. Light uppermost slopes are thinly covered with low growth and *Zoysia*. Light slopes above forest are low growth with thick patches of *Davallia* fern. Patches of swordgrass, *Miscanthus floridulus*, occur on upper left

slope below apex of lava flows. Dark areas on mid-slopes are *Terminalia* forests, and lighter forests on lower slopes are coconut groves. To the lower right is a meadow of *Zoysia* with mounds of dwarfed *Scaevola taccada*.

specimens. Results of the more recent collections and observations were reported by Fosberg and Falanruw (1975, 1980) and Fosberg and others (1977, 1980).

METHODS

The vegetation map (fig. 4) in this report was constructed by demarcating vegetation types on black and white aerial photographs taken in 1944 at 1000 feet, and transposing them onto a tracing of a black and white aerial photograph of the whole island taken at about 10,000 feet in January 1969. Photographs taken during circumnavigations of the island in 1972 and 1975 and an overflight of the island on May 25, 1975, were also used in interpreting the vegetation and constructing the map. The aerial photographs were not vertical; therefore the map may be skewed by the photographic angle. Rough estimates of area (table 1) were derived by estimating percent coverage of types by means of a grid of 256 dots per square inch and multiplying this percentage by the total area of the island. No corrections were made for slope.

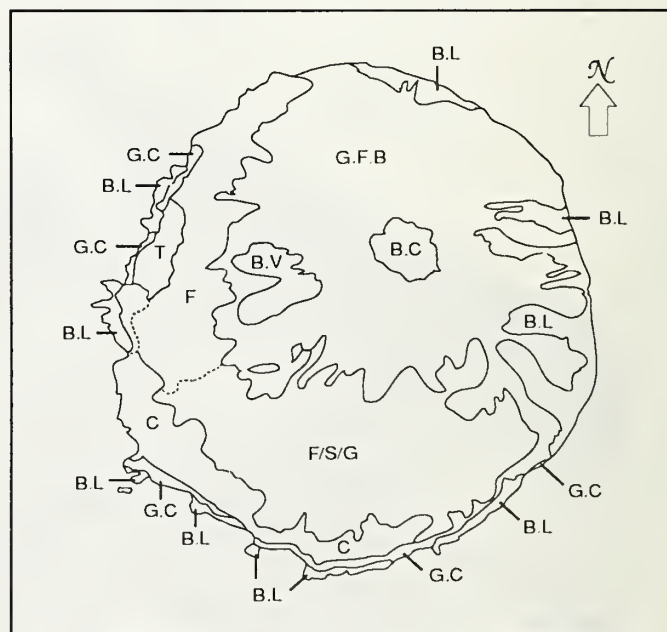


Figure 4—Generalized map of the vegetation of Asuncion. The letters refer to vegetation types (see text).

VEGETATION TYPES

The vegetation of Asuncion as observed in 1972 and 1975 consisted of a mix of species whose occurrence was related to the topography and habitats present. For mapping purposes, the vegetation was divided into the six types (table 1):

Type	Description
B	Mostly barren areas
B.L	Landslide scars and coastal bluffs
B.V	Lava flow of 1906
B.C	Caldera
S	Scrubby growth in ravines of steep slopes, intermediate slopes, and at edges of forest (not mapped because this type is scattered throughout the island in shallow ravines of more barren areas and at edges of forested areas)
G	Low growth in open areas
G.C	Coastal meadows, generally with a mat of <i>Zoysia</i>
G.F.B	Fern and sparse low vegetation of summit and steep slopes
T	Low coastal thickets
F	Forest
F	<i>Terminalia</i> and ravine forests of medium stature and moderate density
F/S/G	Low density forest of medium stature interspersed with scrub growth and coastal meadows too limited in area to be separately demarcated
C	Coconut groves and areas of human influence

VEGETATION TYPE DESCRIPTIONS

Barren Areas

The east coast of Asuncion drops off sharply into the sea; with bare slopes and eroded areas extending from one-third to one-half or more of the distance to the summit. These areas (B.L) are sparsely vegetated or barren. The rocks and cinder sand of the 1906 eruption (B.V) are mostly barren.

Sparse or Low Growth in Open Areas

The vegetation in the area of the summit was studied in the field by examining color aerial photographs taken in 1951 and 1975 (figs. 2, 3). In the 1951 photo, the summit appears to be composed mostly of slide scars and relatively bare rocky ridges. In the 1975 photo, the summit appears greener with at least sparse vegetation all the way to the peak and within parts of the crater.

Table 1—Estimated area of vegetation types, Asuncion, Northern Mariana Islands, 1979¹

Vegetation Type	Symbol ²	Area ha (acres)
<u>Mostly barren lands</u>		
Landslides/ bluffs	B.L	56 (139)
Lava flow of 1906	B.V	15 (37)
Caldera	B.C	13 (32)
Total mostly barren lands		84 (208)
<u>Sparse or low growth of open areas</u>		
Sparse or low growth of summit and steep slopes	G.F.B	322 (795)
Coastal meadows	G.C.	8 (19)
Total sparse/ low growth		330 (814)
<u>Scrub growth in ravines and steep slopes</u>	S	not separately mapped
<u>Thickets, Forest, and Coconuts</u>		
Coastal thickets	T	11 (27)
<i>Terminalia</i> forest	F	76 (188)
<i>Terminalia</i> forest with inclusions of S and G	F/S/G	173 (427)
Coconut groves	C	56 (140)
Total thickets, forest, and coconuts		316 (782)
Total area		730 (1804)

¹Derived by measuring percent coverage of vegetation types by means of a 256 dot/in² grid and multiplying this percentage by the total area of the island. No corrections for slope were made.

²See text for explanations of symbols.

Patches of swordgrass (*Miscanthus floridulus*) grow below the apex of the 1906 lava flow, while the western midslope area is covered with a thick growth composed predominantly of ferns. *Miscanthus* is also abundant below the northern tongue of the lava flow. On the northern side *Miscanthus* is more dense on upper slopes, while the lower slopes are covered with patches of *Pandanus tectorius* down to steep or vertical coastal bluffs.

Vegetation is sparse on the steep upper northeastern slopes with patches of *Miscanthus* amid lower growth. The east coast of Asuncion is steep, with mostly barren landslide scars extending from the shore up to one-third to one-half the distance to the summit. The upper slopes are covered mainly with low growth and some patches of *Miscanthus*, while the lower slopes are covered with grass and scrubby growth in ravines (see type S, described below). Extensive patches of *Crinum asiaticum* occur on lower slopes of the northeastern coast.

The forest on the southwestern slope ends at about 240 m (787 ft) elevation. Above this forest are a few patches of *Miscanthus*. Most of this open area is covered with a dense growth of

ferns approximately 0.5 to 1.0 m tall and consisting chiefly of *Davallia solida* with some *Nephrolepis hirsutula* and stunted *Polypodium scolopendria* mixed in. Beneath the fern covering is a thick, spongy mass of rhizomes and humus at least 0.3 m thick. Sparse patches of *Ipomoea pes-caprae* occur, and *Elephantopus mollis* is scattered in the area, tending to grow in small patches amid the ferns or in denser stands in dryer areas.

The occurrence of *Elephantopus* may be related to the incidence of fire. Just above the ravine forest, this plant was more widespread in 1975 than in 1972 in an area where there had been a fire in the interim. The fire may have resulted from poachers visiting the island to collect coconut crabs. Plastic debris was left in the area, and remains of coconut crabs bound and left hanging in trees were found in the forest below. Above 458-503 m (1503-1650 ft) the fern *Davallia solida* is still common but shorter and more sparse than at lower elevations. The accumulation of rhizomes and humus is also much thinner. Patches of *Elephantopus* are more common. *Nephrolepis* is also common but scattered. There are patches of *Chrysopogon aciculatus*, and some slopes are covered with a pure mat of *Zoysia*. This low vegetation continues to the cloud-covered summit.

The few relatively flat coastal areas of the island are covered with mats of *Zoysia matrella* and shrubs. The flat area just above the coastal bluff on the west coast near the site of a USGS benchmark is covered with a mat of pure *Zoysia*. Inland of this area is an extensive patch of dwarf *Scaevola taccada* which is unusual in having many fastigiate branches with clusters of small leaves at the tips. Flattened and normal branches occur on the same plant. Other small coastal meadows occur on southern and southwestern coasts.

Scrubby Growth

Scrubby growth found in shallow ravines of steep slopes generally consists of a tangle of *Pandanus tectorius*. On more intermediate slopes, and at edges of *Terminalia* forest, small trees are present including *Hibiscus tiliaceus*, *Neisosperma oppositifolia*, *Trema orientalis* var. *argentea*, *Premna obtusifolia*, *Pipturus argenteus*, occasional small *Ficus prolixa* var. *carolinensis*, and *Terminalia* spp. *Erythrina variegata* var. *orientalis* occurred in more open areas.

At their edges, such scrub forests are tangled and difficult to traverse; but toward their interior, where the *Pandanus* is tall and more *Neisosperma* is present, it is possible to walk through the area.

Scrubby growth is scattered throughout the island in shallow ravines in more barren areas and at edges of forest.

Coastal Thickets

Inland of the coastal meadow on the western coast are semi-open thickets of small trees including *Trema orientalis* var. *argentea*, *Pipturus argenteus*, *Terminalia samoensis*, *Hibiscus tiliaceus*, *Morinda citrifolia* and *Neisosperma oppositifolia*. The floor of these thickets is covered with abundant *Polypodium*



Figure 5—View of southwest slope from 670 m. Vegetation in foreground is about 0.5 to 1.0 m tall *Davallia solida* with a thick mass of fern rhizomes and humus below. Light areas are covered with grasses, *Elephantopus*, and thin *Zoysia* mats. A patch of *Miscanthus floridulus* is seen in the center of the photograph. *Terminalia* forest fills the ravine, and lower slopes and coconut groves occur on the lowest slopes.

scolopendria and *Blechnum brownei* f. *puberulum*, with occasional vines of *Operculina ventricosa*, *Vigna marina*, and a few birds nest ferns (*Asplenium nidus*). Occasional small thickets of young and older coconut trees (*Cocos nucifera*) and scattered *Pandanus tectorius* and *Carica papaya* are found here. As the slope steepens further inland, *Carica* and *Asplenium* become more common and understory herbs less common.

Terminalia and Ravine Forest

The most diversified habitat on Asuncion is the *Terminalia* forest of western and southwestern slopes. These forests are best developed in ravines (fig. 5). The tree species present are a relatively consistent mix of scattered *Terminalia* trees, *Premna obtusifolia*, patches of *Morinda citrifolia*, frequent tangles of *Hibiscus tiliaceus*, and clusters of *Pandanus tectorius*. *Trema orientalis* var. *argentea* occurs in more open areas, and there are a few epiphytic *Ficus prolixa* var. *carolinensis*. The *Premna obtusifolia* trees were about 5 to 7 m (16-23 ft) tall with a diameter at breast height (d.b.h.) of about 15 cm (6 in). The soil in the ravines is fairly deep and soft.

The type specimen of *Terminalia rostrata* (Fosberg and Fernald 1974), a species thus far known only from Asuncion, is shown in figure 6.

Coconut Groves and Areas of Human Influence

The most obvious results of human influence on the vegetation of Asuncion are the coconut groves on the southwestern coast. The first trees probably were planted by the original inhabitants of the island. Sanvitores, who visited the island in



Figure 6—The trunk of a large *Terminalia rostrata*, a species thus far known only from the volcanic northern Marianas. Scattered coconut seedlings are in the background; *Pandanus tectorius* to the left, and *Polypodium scolopendria* ferns in the right foreground.

1669 (Garcia 1683), found the inhabitants engaged in subsistence agriculture. La Perouse (1797) mentions coconut groves occupying no more than one-fifteenth of the island's circumference when he visited in 1786. Coconut groves can be seen on military oblique aerial photos taken in August 1944. In these photos, the coconut groves were less dense and had less undergrowth than those observed in 1975. The 1944 photos show clusters of a few houses on the western and southwestern coasts as well as several individual or small groups of apparently thatched houses. Lehne and Gabler (1972) reported, however, that the island was uninhabited in 1935, 1945, 1969, and 1970. A number of areas appeared to be under cultivation in the 1944 photos including three fields near the west coast habitation site. One of the fields resembles a rice paddy. Bowers (1951) and Solenberger (1967) discussed the cultivation of rice in the Mariana Islands since aboriginal times, a practice unique to the Marianas, among all outlying Pacific islands (Solenberger 1967). Yawata (1963) reported charred rice husks in archaeological remains on Asuncion. The lowest of these three fields was visited in 1975 and is now a semi-closed thicket. The soil is too porous to hold water as would be required for wetland taro and rice. It seems likely that the plantings in the photo were *Xanthosoma*, a taro which may be grown in drained soils. What appears to be reflection from standing water could be reflection from leaves laid down as mulch for these plantings.

The 1944 photos show other fields of row plantings near several houses on the southwestern coast. Ravines in both this area and near the west coast habitation site were filled with banana trees. In 1975, banana trees were not common. Scattered on the lower slopes between the two main habitation sites in 1944 photos are standing, dead trees. These trees were probably killed in the process of clearing for gardens, and left standing to serve as trellises for yams (*Dioscorea* spp.). Vine-covered areas near both sites were probably the result of disturbance of the natural vegetation. Specimens of *Dioscorea*

(Falanruw 3090), probably *D. nummularia*, were collected in this area of former habitation in 1975 (Fosberg and others).

La Perouse (1797) describes sparse, stunted coconut trees interspersed with lianas and a small number of plants in areas of fairly recent lava flows. I did not see woody lianas on Asuncion, but a number of aggressive vines were present including *Cassytha filiformis*, *Vigna marina*, *Ipomoea pes-caprae* spp. *brasiliense*, and *Operculina ventricosa*. *Operculina* was observed growing over much of the vegetation of Guguan island in 1971, and both *Ipomoea* and *Cassytha* grow on relatively new volcanic surfaces on Guguan.

FAUNA

Because Asuncion has been recommended as a biological reserve, and the island is so rarely visited by biologists, the following notes on the island's terrestrial fauna at the time of my visits are reported.

The endangered species *Megapodius laperouse laperouse* was observed in vegetation types S, T, F, and C. The occurrence of this bird (figs. 7, 8), in the Northern Mariana Islands, is discussed elsewhere (Falanruw 1975).

Reptiles observed on Asuncion included *Gehyra oceanica* in type F and numerous *Emoia* cf. *caeruleocauda*, especially in type S, T, F and C, including a pair mating on July 7, 1975. Golden *Cryptoblepharus* cf. *boutoni* (Falanruw specimen 3079) were common on the ground. The *Cryptoblepharus* observed on the ground on Farallon de Pajaros and Maug were blackish. The *Cryptoblepharus* of Guam are golden colored but normally found on tree trunks.

Three large skinks *Emoia slevini* were observed near a pile of coconuts in a western ravine (type C). The largest was all brown, the smallest had black markings on a lighter brown



Figure 7—An adult megapode (*Megapodius laperouse laperouse*) perched on a branch of *Neisosperma oppositifolia*. Although this bird was usually seen scratching on the ground, both the chick (fig. 8) and the adult can fly.



Figure 8—A young *Megapodius laperouse laperouse* photographed on Asuncion, July 8, 1975.

background, and the third (Falanruw specimen 3078) was brown with gold flecks. This recently described species (Brown and Falanruw 1972) was formerly known only from Guam, Rota, and Tinian. Two large skink eggs found in what appeared to be an old megapode nest mound seen on July 7, 1975, probably belonged to this species.

In a total of 5 1/2 days on Asuncion, I sighted no introduced monitor lizards (*Varanus indicus*). These large lizards, which prey on coconut crabs (*Birgus latro*), rodents, and birds and their eggs, were common on Pagan, Sarigan, and Anatahan.

La Perouse (1797, p. 306-309) mentioned "many large fierce looking coconut crabs" on Asuncion. On the 1971 and 1975 visits I noted many signs of large coconut crabs in types S, T, F, and C. On the morning of July 6, 1972, while collecting plants in the forest, I saw nine, including a heavily gravid female on a bluff above the sea, a small crab with a carapace 7.5 to 10 cm (3-4 in) wide and seven large males with carapaces 12.5 to 16.3 cm (5-6 in) wide. When the island was visited in early July 1975, a number of empty molting holes were observed in type F, and crabs were less abundant than in 1972. Signs of poachers, perhaps from a ship seen in the area of Asuncion during the aerial survey on May 25, 1975, were noted.

DISCUSSION

The vegetation of Asuncion today reflects the natural history of the island as well as human influence. Yawata's (1963) findings and the reports of Father Sanvitores (Garcia 1683) suggest aboriginal habitation followed by one or more volcanic eruptions between 1669 and 1786, after which the vegetation recovered fairly rapidly. Another eruption occurred in 1906, leaving the inverted V-shaped flow which was mostly barren in 1975.

To these volcanic disturbances may be added the effects of irregular rainfall and typhoons. Examination of photos of Far-

allon de Pajaros and Guguan taken over a number of years indicates that the vegetation, of exposed areas especially, may be greatly influenced by short-term weather conditions. The greening of the upper slopes of Asuncion between the time of the 1951 photo and the 1975 visit could have been due as much to favorable weather conditions just before the 1975 visit as to the gradual development of vegetation on this young volcanic island.

Human habitation on Asuncion is evident from the coconut groves, formerly cultivated plants and naturalized introductions (table 2), such as *Pithecellobium dulce*. These trees of Mexican origin grow on formerly inhabited sites along with a number of New World weeds. The agricultural activities seen in 1944 photos probably represent a mix of Carolinian, Chamorro, and Japanese efforts.

The thick fern growth about the summit of Asuncion may represent the original vegetation of this area. The summits of more southern islands in the chain are commonly in swordgrass, a species that tends to follow burning activities associated with their longer history of human habitation.

The *Terminalia* forests on the lee slopes and ravines of Asuncion appear to be the best developed native forest type currently occurring in the chain north of Saipan. This situation is largely due to the relatively sheltered contiguous area available for forest development. The tree associations on other islands appear to be more a mix of species that have reached the island and can survive in the limited favorable habitat of the smaller islands or in scattered areas of suitable habitat of the larger islands which are more dissected by steep ravines than is Asuncion.

Inasmuch as the fruits of *Terminalia* trees provide edible kernels, the trees may have been favored by early inhabitants. In addition, seed of the tree is dispersed by fruit bats, which feed on the husk.

The smaller islands of Farallon de Pajaros and Guguan have been nominated as "Islands for Science" reserves. The larger islands of Agrihan, Alamagan, Pagan, Anatahan, and Sarigan have been more affected by human habitation in recent times including the introduction of goats, pigs, and cattle. The findings reported in this paper support the International Biological Programme recommendation for protecting Asuncion. The island is unique in the chain of young volcanic Mariana islands in having a native forest type, the main species of which appears to be endemic. The dense growth of ferns about the summit may represent the original summit vegetation. On the larger islands, more affected by humans and burning activities, this fern vegetation type appears to be replaced by swordgrass (*Miscanthus floridulus*). Asuncion also provides habitat for the endangered species *Megapodius laperouse laperouse*, and the skink *Emoia slevini* formerly known only from Guam, Rota, and Tinian.

In the Marianas chain, only Asuncion and the smaller islands of Farallon de Pajaros, Guguan, and Maug are uninhabited by people and free of goats, pigs, and cattle. Of the islands that are free of such introduced threats to native fauna, Asuncion provides the largest area of sheltered habitat for the native, endemic, and endangered fauna present in this chain of islands frequently affected by violent typhoons.

Table 2—Vascular plants of Asuncion, Northern Mariana Islands

Scientific Name ¹	Family	Habit ²	Status ³	Occurrence in types G&T ⁴
<i>Achyranthes aspera</i> L.	Amaranthaceae	SS	N	
<i>Achyranthes canescens</i> R.Br.	Amaranthaceae	SS	N	T
<i>Artocarpus altilis</i> (Park.) Fosb.	Moraceae	T	I/C	
<i>Asplenium nidus</i> L.	Polypodiaceae	F	N	T
<i>Blechnum brownii</i> f. <i>puberulum</i> Leonard	Acanthaceae	H	I	T
<i>Calanthe triplicata</i> (Willem.) Ames	Orchidaceae	H	N	T
<i>Capsicum frutescens</i> L.	Solanaceae	S	I	T
<i>Carica papaya</i> L.	Caricaceae	HST	I	T
<i>Cassytha filiformis</i> L.	Lauraceae	V	N	G
<i>Chrysopogon aciculatus</i> (Retz.) Trin.	Gramineae	G	N	G
<i>Citrus aurantium</i> L.	Rutaceae	T	C	
<i>Cocos nucifera</i> L.	Palmae	PT	I	
<i>Crinum asiaticum</i> var. not determined	Liliaceae	H	I	G
<i>Cyperus cyperinus</i> (Retz.) Suringar	Cyperaceae	G	N	G
<i>Cyperus javanicus</i> Houtt.	Cyperaceae	G	N	T
<i>Davallia solida</i> (Forst.f.) Sw.	Polypodiaceae	F	N	G,T
<i>Desmodium triflorum</i> (L.) DC.	Leguminosae	H	I	G
<i>Digitaria gaudichaudii</i> (Kunth) Buse	Gramineae	G	N	
<i>Digitaria radicata</i> (J.S. Presl) Miq. Syn: (<i>Digitaria timorensis</i> [Kunth] Balansa)	Gramineae	G	N	G,T
<i>Dioscorea nummularia</i> Lam.	Dioscoreaceae	V	C/I	
<i>Dodonaea viscosa</i> (L.) Jacq.	Sapindaceae	S	N	G
<i>Elephantopus mollis</i> HBK.	Compositae	H	I	T,G
<i>Erythrina variegata</i> var. <i>orientalis</i> (L.) Merr.	Leguminosae	T	N	
<i>Euphorbia hirta</i> L.	Euphorbiaceae	H	I	
<i>Euphorbia</i> sp.	Euphorbiaceae			G
<i>Ficus prolixa</i> var. <i>carolinensis</i> (Warb.) Fosb.	Moraceae	T	N	T
<i>Fimbristylis boninensis</i> Hayata Syn: (<i>F. urakiasiana</i> Kük.)	Cyperaceae	G	N	G
<i>Fimbristylis cymosa</i> R.Br.	Cyperaceae	G	N	T
<i>Glossogyne tenuifolia</i> (Labill.) Less.	Compositae	H	N	T
<i>Hedyotis foetida</i> var. <i>mariannensis</i> (Merr.) Fosb.	Rubiaceae	SS	N	
<i>Heteropogon contortus</i> (L.) Beauv.	Gramineae	G	N	G
<i>Hibiscus tiliaceus</i> L.	Malvaceae	ST	N	T

Continued

Table 2—Vascular plants of Asuncion, Northern Mariana Islands (continued)

Scientific Name ¹	Family	Habit ²	Status ³	Occurrence in types G&T ⁴
<i>Ipomoea pes-caprae</i> ssp. <i>brasiliensis</i> (L.) v. Ooststr.	Convolvulaceae	V	N	T,G
<i>Ischaemum longisetum</i> var. <i>raulersoniae</i> Fosb. & Sachet	Gramineae	G	N	G
<i>Jasminum marianum</i> DC.	Oleaceae	SS	N	
<i>Lepturus repens</i> (Forst.f.) R.Br.	Gramineae	G	N	
<i>Melanolepis</i> <i>multiglandulosa</i> var. <i>glabrata</i> (Muell.- Arg.) Fosb.	Euphorbiaceae	ST	N	T
<i>Miscanthus floridulus</i> (Labill.) K. Schum. & Laut.	Gramineae	G	N	G
<i>Morinda citrifolia</i> L. var. <i>citrifolia</i>	Rubiaceae	S/ST	N	T
<i>Musa x sapientum</i> L.	Musaceae	HST	C	
<i>Neisosperma</i> <i>oppositifolia</i> (Lam.) Fosb. & Sachet	Apocynaceae	ST	N	T
<i>Nephrolepis hirsutula</i> (Forst.f.) Presl	Polypodiaceae	F	N	G
<i>Operculina ventricosa</i> (Bert.) Peter	Convolvulaceae	V	I	T
<i>Oplismenus compositus</i> (L.) Beauv.	Gramineae	G	N	
<i>Pandanus tectorius</i> Park. sensu latissimo (Incl. <i>P. pseudo-menne</i> Hosok.)	Pandanaceae	ST	N	T,G
<i>Paspalum orbiculare</i> Forst. f.	Gramineae	G	N	G
<i>Peperomia mariannensis</i> C. DC. f. <i>mariannensis</i>	Piperaceae	H	N	
<i>Phyllanthus amarus</i> Sch. & Th.	Euphorbiaceae	H	I	
<i>Phyllanthus marianus</i> Muell.-Arg.	Euphorbiaceae	H	N	T
<i>Pipturus argenteus</i> (Forst.f.) Wedd.	Urticaceae	ST	N	T
<i>Pisonia grandis</i> R.Br.	Nyctaginaceae	T	N	
<i>Pithecellobium dulce</i> (Roxb.) Benth.	Leguminosae	T	I	
<i>Polypodium</i> <i>scolopendria</i> Burm.f.	Polypodiaceae	F	N	T,G
<i>Portulaca australis</i> Endl. Syn: (<i>Portulaca</i> <i>samoensis</i> v. Poelln.)	Portulacaceae	H	N	
<i>Portulaca oleracea</i> var. <i>granulato-</i> <i>stellulata</i> v. Poelln.	Portulacaceae	H	N	
<i>Premna obtusifolia</i> R.Br.	Verbenaceae	ST	N	G,T
<i>Pteris quadriaurea</i> Retz.	Polypodiaceae	F	N	

Continued

Table 2—Vascular plants of Asuncion, Northern Mariana Islands (continued)

Scientific Name ¹	Family	Habit ²	Status ³	Occurrence in types G&T ⁴
<i>Psilotum nudum</i> (L.) Beauv.	Psilotaceae	H	N	
<i>Saccharum officinarum</i> L.	Gramineae	G	C	
<i>Scaevola taccada</i> (Gaertn.) Roxb.	Goodeniaceae	S	N	T
<i>Solanum guamense</i> Merr.	Solanaceae	S	N	
<i>Solanum melongena</i> L.	Solanaceae	S	C	
<i>Stenotaphrum</i> <i>micranthum</i> (Desv.) Hubb.	Gramineae	G	N	
<i>Tacca leontopetaloides</i> (L.) O.Ktze.	Taccaceae	H	N	
<i>Terminalia catappa</i> L.	Combretaceae	T	N	
<i>Terminalia rostrata</i> Fosb. & Falanruw	Combretaceae	T	N	
<i>Terminalia samoensis</i> Rech.	Combretaceae	ST	N	T
<i>Trema orientalis</i> var. <i>argentea</i> (Pl.) Laut.	Ulmaceae	ST	N	T
<i>Vernonia cinerea</i> (L.) Less.	Compositae	H	N	G,T
<i>Vigna marina</i> (Burm.) Merr.	Leguminosae	V	N	G,T
<i>Zoysia matrella</i> (L.) Merr.	Gramineae	G	N	

¹Source: Fosberg and others (1975, 1977, 1980), Fosberg and Falanruw (1974, 1975, 1980). Taxonomy, nomenclature, and status of species follow Fosberg and others (1979, 1982, 1987).
²F = fern; G = grass or sedge; H = herbaceous; HST = herbaceous small tree; PT = palm tree; S = shrub; SS = subshrub or scandant shrub; ST = small tree; T = tree; V = vine.
³N = native; I = introduced; C = cultivated or semi-cultivated.
⁴T = low coastal thickets; G = Sparse/low growth on open areas.

REFERENCES

- Beechey, F.W. 1831. *Narrative of a voyage to the Pacific and Beering's Strait*. London: Henry Colburn and Richard Bently. 2 vol.
- Bowers, N.M. 1951. *The Mariana, Volcano and Bonin Islands*. In: Freeman, Otis W., ed. *Geography of the Pacific*. New York.
- Brown, W.C.; Falanruw, M.V.C. 1972. A new lizard of the Genus *Emoia* (Scincidae) from the Marianas Islands. *Proc. Calif. Acad. Sci.* 39(9):105-110.
- Falanruw, M.V.C. 1975. Distribution of the Micronesian Megapode *Megapodius laperouse laperouse* in the Northern Mariana Islands. *Micronesica* 11:149-150.
- Fosberg, F.R.; Falanruw, M.V.C. 1974. A new Micronesian *Terminalia* (Combretaceae). *Phytologia* 28(5):469-470.
- Fosberg, F.R.; Falanruw, M.V.C. 1975. Noteworthy Micronesian plants. 1. *Micronesica* 11(1):77-80.
- Fosberg, F.R.; Falanruw, M.V.C. 1980. Noteworthy Micronesian plants. 2. *Micronesica* 16(2):201-210.
- Fosberg, F.R.; Falanruw, M.V.C.; Sachet, M.-H. 1975. Vascular flora of the Northern Mariana Islands. *Smithson. Contrib. Bot.* 22:iii, 45.
- Fosberg, F.R.; Falanruw, M.V.C.; Sachet, M.-H. 1977. Additional records of vascular plants from the northern Mariana Islands. *Micronesica* 13(1):27-31.
- Fosberg, F.R.; Falanruw, M.V.C.; Sachet, M.-H. 1980. Additional records of vascular plants from the northern Mariana Islands 2. *Micronesica* 16(2):211-214.
- Fosberg, F.R.; Sachet, M.-H.; Oliver, R. 1979. A geographical checklist of the Micronesian Dicotyledonae. *Micronesica* 15(1-2):41-295.
- Fosberg, F.R.; Sachet, M.-H.; Oliver, R. 1982. Geographical checklist of the Micronesian Pteridophyta and Gymnospermae. *Micronesica* 18(1):23-82.
- Fosberg, F.R.; Sachet, M.-H.; Oliver, R. 1987. A geographical checklist of the Micronesian Monocotyledonae. *Micronesica* 20(1-2):19-129.
- Garcia, F. 1683. *Vida y martirio de el venerable Padre Luis de Sanvitores de la Compania de Jesus, Primer Apostol de las Islas Marianas*. Madrid, Spain.
- La Perouse, J.F. de. 1797. *Voyage de La Perouse autour du monde....* 4 vol. Paris.
- Lehne, P.H.; Gabler, C. 1972. *Über die Marianen*. Lehne-Verlag, Wohldorf, West Germany: Lehne-Verlag. 47 p.
- Solenberger, R.R. 1967. The changing role of rice in the Mariana Islands. *Micronesica* 3(2):97-103.
- Tanakadate, H. 1940. Volcanoes in the Mariana Islands in the Japanese mandated South Seas. *Bull. Volcanol., Ser. 2*, 6:100-223.
- Tayama, R. 1936. *Geomorphology, geology and coral reefs of the N. Mariana group*. Instit. Geol. Paleontol. Tohoku Univ. 21.
- Yawata, I. 1963. Rice cultivation by the ancient Marianas islanders. In: Barrau, J., ed. *Plants and the migrations of Pacific peoples: Tenth Pacific Science Congress*; 21 August-6 September, 1961; Honolulu, HI: Bishop Museum Press: 91-92.



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